ADDRESSING THE SOCIO-ECONOMIC DETERMINANTS AND CONSEQUENCES OF THE DIGITAL DIVIDE

SYNOPSIS

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1. INTRODUCTION

"Technology fosters equality, and it's often the relatively cheap and mundane devices that do the most good." – William J. Clinton

India is one of the fastest-growing economies. Economic growth is a sign of prosperity, improved standard of living, increased access to goods and services, and happiness. Does the economic growth indicate that the income of the entire population has increased and brought happiness for all by providing equal access to goods and services? Despite growing at a very high rate for years, the Indian economy witnesses various kinds of inequalities, and it is considered as a poor and unequal country, with an affluent elite (World Inequality Report 2022).

Inequality is the state of not being equal. It is a phenomenon that is primarily related to social justice and involves inequality issues of status, rights, and opportunities. Inequality is a social evil that exists in nearly all countries of the world. Inequality exists when people do not have the same level of material possessions and lack equal opportunities to live a desired lifestyle. It has become a widespread concern that certainly hampers the overall well-being. Indians have suffered extreme income and wealth inequalities since the British colonial rule. Considering the income inequality statistics of the year 2021, the top 1 per cent and 10 per cent of the Indian population hold a significant share of 21.7 per cent and 57.1 per cent respectively of the total national income. The bottom 50 per cent of them holds merely 13.1 per cent of it. The wealth inequality has also widened up over the years as currently the top 1 per cent and 10 per cent of the country's population owns 33 per cent and 64.6 per cent share respectively of the total wealth in the country while, the bottom 50 per cent resides with only 5.9 per cent share (World Inequality Report 2022).

India has been continuously working to eradicate inequality. The country strives for equality by the implementation of several schemes and policies formulated towards equal distribution of income and wealth among the citizens. Fair and equitable distribution of income and wealth can solve major economic, social, and political discrepancies such as poverty, unjust behaviour, unfair aspects, and political conflicts. In other words, if the country aims for equality, it can lead to poverty alleviation; ensure equal opportunities and rights for all genders, and can also boost social cohesion along with the reduction in political conflicts. All these parameters can enable an increase in the well-being and can

also correspond to the economic growth (Clements, et al., 1999).

However, considering recent scenarios, well-being and economic growth were immensely hampered when India was hit by COVID (Harvard T.H. Chan, 2021) originated in China in late 2019 and early 2020 (IMF, 2021). The Indian government resorted to a complete lockdown with urgent closure of businesses, schools, institutions, factories, and other operating units in the economy. A mammoth population of about 1.39 billion was restrained from stepping out of their homes (Ray et al., 2020).

The pandemic led to a gradual escalation in the use of technology. Technology is the application of knowledge scientifically to different events, happenings, production processes, businesses, or even to everyday human life (Habibie, et al., 2021). Information and Communication Technology (ICT) played an important role during the pandemic (Barton, et al., 1985). The use of ICT expanded acutely due to worldwide lockdown. Technology helped individuals to communicate, interact, collaborate, learn and receive information along with developing a critical thought process. It reduced complexities and influenced the people to shift towards more advanced processes. But the matter of concern is that whether these facilities are available for all?

It is rightly said by William J. Clinton, "It is dangerously destabilizing to have half the world on the cutting edge of technology while the other half struggles on the bare edge of survival."

The Covid-19 pandemic has caused serious issues to the nation. Digital inclusion has become the major concern of government programs where everyone is certainly required to be well-trained in using technology (International Trade Centre, 2020). But existence is quite different from expectations, and it has been found that there is significant existence of digitally excluded people, or a wide gap exists in technology management which is commonly known as the digital divide (Duersen, 2020).

The usage of technology has been prevalent, but the digital divide remains a challenge while handling complex situations. Introduced in the later 1990s, the term "Digital Divide" is referred to as the inequality between individuals, businesses, households, groups, or even the countries in terms of availability, access, use, skills, and quality-of-use of ICT (Singh, 2010). The digitally privileged and underprivileged sections widen social inequalities.

The digital divide can be seen globally between industrially developed and developing nations. It can be understood in terms of internet connectivity, access, and use which remains a recurrent challenge for

the development of any nation (Digital Economy Report, 2021). The digital divide is determined by the demand and supply side factors of the economy. On the demand side, the gap encompasses the accessibility and affordability of digital devices whereas, on the supply side, it lays focus on the infrastructural availability (Srinuan, 2012). It also exists between users and non-users of digital techniques (vertical digital divide) and within a group of digital techniques users (horizontal digital divide) (KADO, 2004).

The digital divide can be realized on three different levels. Figure 1 exhibits the different levels of the digital divide. For an individual to be digitally sound, it is mandatory to have access to digital techniques. Besides having access, one should possess adequate knowledge and skills for using them. The ability to reach the optimum outcome and mobilizing digital resources efficiently is also required. In the context of the Indian population, there is a segment that lacks at one or the other levels (Ferreira et al., 2021).

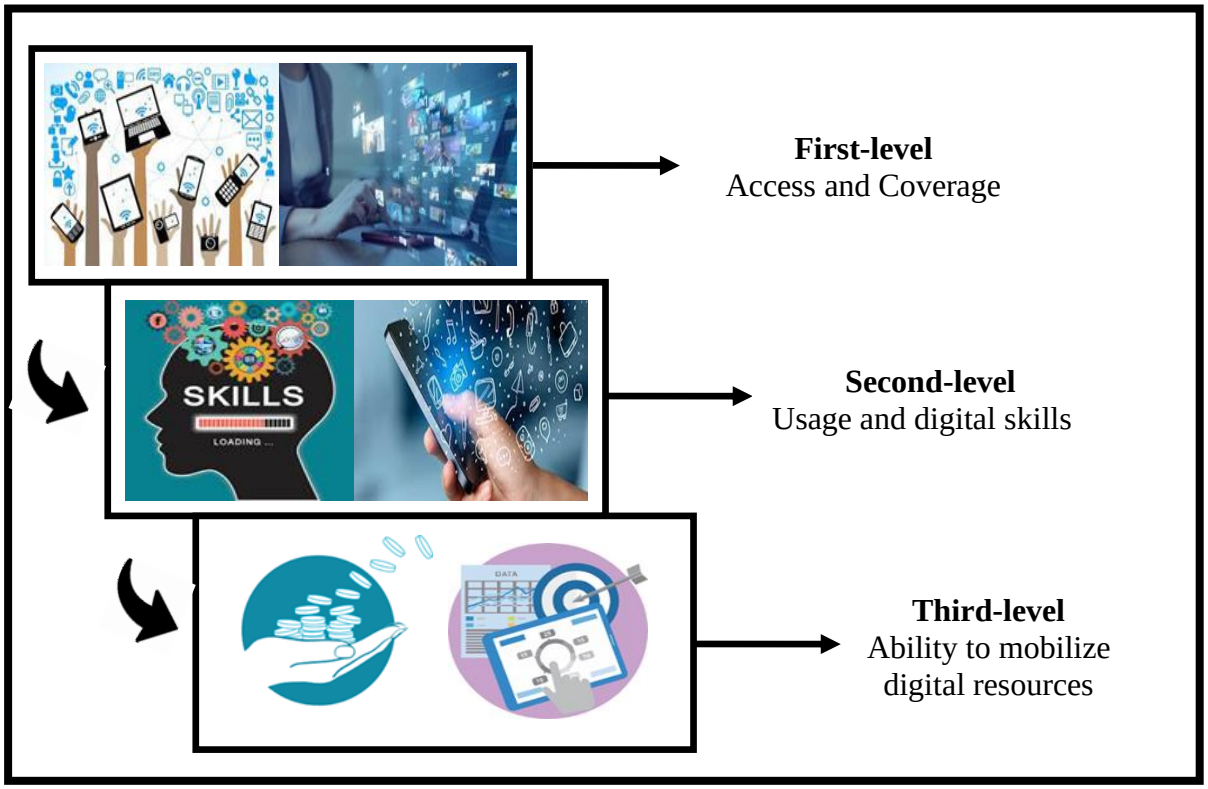

Figure 1: Levels of Digital Divide
Self-Structured

The digital divide affects the key macroeconomic variables which are productivity, inequality, economic growth, and development at large (Yusuf, 2021). The unequal access to digital resources leads to an overall negative impact on the economy (IEEE, 2023). Access, skills, and knowledge of using digital

devices have become essential requirements to secure employment in today's technology-driven world. Employment generates income which is further positively related to technology diffusion. Thus, with the improvement in the financial condition of a person, technology adoption is likely to increase (Kallal, et al., 2020). Another paramount effect of the digital divide on the economy is that it moves towards creating a poverty trap (Barbier, 2022). The vicious cycle of the mutual influence between poverty, lack of education, lack of access to digital devices and related skills, and ultimately the struggles of obtaining a job forms the situation of the inescapable digital poverty trap. This trap can further be a reason for low economic growth and development.

The government of India aims to make India a transformed digital economy. In fulfilling its aim, the "Digital India Programme" was launched on July 1, 2015. Till then, only 19 per cent of the total Indian population had access to and knowledge about the internet while merely 15 per cent of the total population carried mobile phones and knew how to use them (Ray, 2021). The emphasis of the government has clearly been reflected in the Union Budget 2022 announced by Smt. Nirmala Sitharaman (Finance Minister, GOI) on February 1, 2022. Steps towards the digital economy and other technology-driven development aspects become the primary goals of the 'Amrit Kaal' vision of India (Mahajan et al., 2022). Health, education, banking, and other sectors were proposed to grow backing them with digitized facilities. Initiatives such as skill e-labs, digital university, Ayushman Bharat Digital Mission, and digital banking units are proposed for the betterment of the country and will work as a way towards the formation of Digital India (National Portal of India, 2022).

A digitally sound person can carry out tasks more efficiently, easily, learn new things, access materials, and can even resolve several day-to-day problems (Jacob, 2016). The government tries for digital inclusion by reaching the grassroots level, but still, the digital gap prevails in the nation. It was strongly noticed during the pandemic when digital usage was required to fulfill multiple requirements. COVID-19 has made it very clear that the use of technology is not only a 'nice-to-have' but a 'must-have' aspect of everybody's life. Digital inclusion is vital for development and in handling complexities. Extensive efforts need to be made to provide all population groups equal chances to be part of the information society. Therefore, the present study has been undertaken and entitled *Addressing the Socio-economic Determinants and Consequences of the Digital Divide*.

2. REVIEW OF LITERATURE (*Summary Sheet: Annexure 1*)

The world has been witnessing a disparity between the haves and the have-nots for 30 years down the line hampering the economic growth of several countries (Cingano, 2014; Voitchovsky, 2009; Sahasranaman, et al., 2020). Inequality has become a major concern worldwide covering almost two-thirds (71 per cent) of the world population (World Social Report, 2020). Considering global income inequality in 2021, around 52 per cent of the global income was held by the richest 10 per cent of the population and the poorest of them were owners of only 8.5 per cent of it. Wealth inequality was in a more pathetic state where the richest 10 per cent enjoyed around 76 per cent of the global wealth while the poorest 50 per cent of the population availed just 2 per cent of it (World Inequality Report 2022).

India possesses different types of inequalities such as income, gender (Amutha, 2017), tax (Agrawal, 2020), health (Gwatkin, 2000), education (Kundu, 2014), regional (Nayyar, 2008), and well-being (Alam, et al., 2015). Income, wealth, and gender discrimination (Banerjee, 2013; Gupta, 2017; Sivakumar, 2008; Venkatesan, 2019) immensely persists in India. India aims to alleviate different types of inequality through the implementation of several schemes and policies for promoting fair and equitable distribution of income and wealth (Bourguignon, 2018; OECD, 2017). Besides the income and wealth inequality, there is a huge variation witnessed in the living standard of the people (Balasubramanian, et al., 2021) which is a reason for hampering the economic growth of India (Venkatanarayana, 2011).

In 2020, the pandemic and lockdown situations aggravated inequalities (Anand et al., 2021). The lockdown and the requirement of keeping social distance led people to be dependent on the internet and related services (Block et al., 2020; De et al., 2020). This has further increased the interaction between human beings and digital systems. An already existing reliance on digital techniques, connectivity, and infrastructure increased to a new level (Ramos, 2020) leading to a rise in the overall global internet usage by around 62 per cent of the world's total population (Data Reportal, 2021). India also witnessed an upsurge in the total internet users to around 825.30 million nearby March 2021 (Telecom Regulatory Authority of India, 2021).

The increased online usage has led to the increase in the usage of Information and Communications Technology (ICT) which was observed to be beneficial during the pandemic (Bajpai et al., 2020). ICT

along with the internet has managed to shift even the routine activities and services to online mode (Asfiya, et al., 2021; Bogdat-Brzezinska, 2020). Services including transactions, communications, routine, finances, and lifestyle such as e-business, e-health, e-learning, e-banking, e-finance, along with surfing, blogging, shopping, and videos have become part and parcel of a person's day-to-day life (Cilan et al., 2007).

However, the pandemic clearly stated all the intricacies. The metaphor; digital divide (Ferro et al., 2007) has several definitions and is widely used to depict inequalities regarding digital technologies (Bach, et al., 2013; Dijk, 2006). It was first used by the National Telecommunications and Information Administration (U.S. Department of Commerce) and describes the gap between digitally sound and unsound people (Pinkett, 2003).

Technology advances inveigled towards bringing a gap (Rodriguez-Abitia, et al., 2020). The gap acknowledged some people having access, knowledge, and skills of using the digital techniques (haves) and the ones belonging to the underprivileged section who neither had access nor knowledge/skills regarding the same (have-nots); and also, the ones who might possess one or the other characteristics showing the disparity between different sections of society (Hanna, 2021; Katz, 2019).

Access to ICT, usage, skills, and the ability to mobilize digital resources are the levels within which a considerable divide can be witnessed all over India (Ferreira et al., 2021; Aissaoui, 2021; Ruiu et al., 2017; Ragnedda et al., 2018). ICT has been a significant reason for the gap between the traditional and modern methods of learning, information storage, and others (Nkanu, et al., 2010).

In general, the basic divide, horizontal divide, vertical divide, and the dual divide are the kinds of the digital divide. The basic digital divide encompasses only the presence of digital hardware and software (Sorj, 2008), whereas the remaining three are associated with the second and third-level digital divide. The horizontal digital divide (within users), the vertical digital divide (between users and non-users), and the dual divide (with more than one obstacle between users and non-users) are found at global, national, and regional levels (KADO, 2004).

Several studies suggest that the gap in ICT adoption can be determined as per the composition of households, wealth aspects, occupation of the people, and education (Kilenthong, et al., 2014; Ayanso, et al., 2010). The unprecedented shortage of digital skills and the adequate mobilization of digital

resources also contribute to a wide gap (Spitzer, et al., 2013). These gaps persist between different segments of people posing concerning threats and challenges (Lyons, et al., 2019).

Access, knowledge, and usage of digital technologies have paved their way from being optional to essential in a person's life and are also counted as a vital part of every industry's future (West, et al., 2019; Shortt, et al., 2020). Several demographic and economic variables along with infrastructure, pricing, and quality indicators determine the characteristics of an economy regarding digital perspectives and are significant for measuring the gap (Chinn, et al., 2004; Yanti, et al., 2014; Buys, et al., 2008; Islam, et al., 2021). Some of the factors have become the attributes to the persistent gaps in the digital divide such as income, age, education, parental status, disabilities, race, and ethnicity. The persistent gap has been a crucial issue and leads to overall inequality witnessed since many years (Prudhomme, et al., 2009).

India faces several challenges regarding the availability, accessibility, and affordability of digital technologies (Sheikh, 2017). Another problem observed is the presence of digital exclusion. Many people remain deprived of using digital techniques or are digitally excluded and do not participate to their fullest in society (Sanders, 2020; Selwyn, 2004; Dutton, et al., 2013; Seale, 2009). Ultimately, digital inclusion (Helsper, 2008) is an important aspect for promoting prosperity and equality in the economy (Kumar, et al., 2021).

There is a dire need to reduce the digital gap immediately for helping the people as well as contributing to economic growth and development (Eshetu, et al., 2010). An increase in digital skills among the people of the country can eventually lead to bridging the gap (Varallyai, et al., 2013; Aqili, et al., 2008). The future of almost all industries lies in the adoption of advanced technological aspects (Liu, 2021; Jackman, et al., 2021). It is necessary to ensure that the digital economy should reach the grassroots level (digital inclusion) and should be adequately acknowledged by the people for embarking on the nations' progress (Tomer, et al., 2020).

3. NEED OF THE STUDY

Technology has made the life of people comfortable and swift. It also helps people to complete tasks timely and deal with complexities efficiently. The government aims to make the country digitally empowered in the field of technology. A digitally connected economy has the potential to improve the

socio-economic conditions of people through sustained and fast economic and social advancements. In this regard, the government has initiated various schemes to transform India's traditional governance method. Some progress has been made but still, there are many challenges. Digital exclusion is astonishing at various levels. Around 6,378 million people are smartphone users and around 825.30 million people are having internet facilities (Telecom Regulatory Authority of India, 2021). Considering the entire population of India, the numbers are quite low and pertain to the presence of a gap. Besides the access to ICT, a gap also prevails in the usage and knowledge of digital skills along with the mobilization of these resources which have not been given adequate importance.

The digital divide is critically associated with the country's economic, social, and technological spheres. The economic sphere involves factors such as income, employment status, educational attainment, parental status, and community type. Likewise, race, ethnicity, language, and religion are factors of the social sphere while the technological sphere involves the access, usage, and quality of use of digital techniques.

In the seventh edition of the Digital India Awards, 2022, the President of the country, Smt. Droupadi Murmu acknowledged the fact that the country has adopted innovation of digitals that has also encouraged inclusion, but it still needs to breach digital inequality to become a digitally empowered economy. In this direction, the union budget 2023 announced a reduction in the tax rates on the parts of mobile phones for stimulating their production. The government has also encouraged spending on digital infrastructure development and is motivated towards implementing several schemes for hardware and software penetration in all areas.

The study will be directed towards describing the extent of digital inequality in the economy. It will primarily focus on the persistent socio-economic determinants responsible for creating the digital divide. Further, it will address the probable socio-economic consequences of the divide. The existing literature on various parameters of the digital divide at various levels is limited, specifically to the educational aspects, and does not provide possible directions for digital inclusion. The main implication of the study will be directed towards proposing a framework for connecting the unconnected population. The study will be a consequential attempt in exploring the various aspects of the digital divide.

The research will be directed towards finding answers to certain questions that are as follows-

1. What is the status and extent of the digital divide at different levels?
2. How does the digital divide affect society and the economy?
3. What are the various socio-economic factors contributing to digital inequality?
4. How can digital inclusion be promoted in India for continuous development and what are the barriers in bridging the digital divide?

4. OBJECTIVES OF THE STUDY

The research will be directed towards achieving the following objectives-

1. To analyze the status and extent of the digital divide.
2. To evaluate the effects of the digital divide on society and the economy.
3. To investigate diverse socio-economic factors that contribute to digital inequality.
4. To analyze challenges in bridging the digital gap and to propose a strategic framework to address the problem.

5. RESEARCH METHODOLOGY

For obtaining the objectives of the study and to conduct research systematically, the following research methodology has been proposed-

5.1 Research Type: Descriptive and Analytical

5.2 Research Design: The research data collection will be as follows-

5.2.1 *Research Data-*

- ***Primary Data:*** Primary data will be collected using schedules and questionnaires that will be administered to the individuals of the concerned region.
- ***Secondary Data:*** Secondary data will be collected from concerned books, magazines, journals, newspapers, websites, and other related literature. Some of the sources include the Census (Government of India), the Organization for Economic Co-operation and Development (OECD), the World Bank, the Telecom Regulatory Authority of India (TRAI), the Department of Telecommunications, the Competition Commission of India, and the Economic Times.

5.3 Sample Design-

5.3.1 *Region of study:* Uttar Pradesh, India

Being the largest state of India, Uttar Pradesh deals with major socio-economic hurdles such as low

literacy levels, inherent gender biases, widespread poverty, and inequality. Besides being the largest state, Uttar Pradesh is the most populous state with an approximate population of 19.98 crores leading to about 16.50 per cent of the total population of India (Census 2011). Another paramount reason is that the state eventually stood last in the Public Affairs Index, 2021 which was prepared by the Bengaluru-based think tank called the Public Affairs Centre. The index calculated is a composite score of 3 broad factors namely growth, sustainability, and equity in which the state was positioned on the last rank.

Since the state has major socio-economic hurdles and fails in the growth and equity parameters tested under the Public Affairs Index, there might be a considerable gap among individuals regarding access and usage of digital techniques. Thus, Uttar Pradesh has been taken purposively for the study.

5.3.2 ***Sampling Techniques:*** Purposive and Stratified Random Sampling (*Annexure 2*)

For conducting a comprehensive study, Uttar Pradesh has been divided into 4 zones (North, South, East, and West). From each zone, one district has been chosen randomly. Two blocks from each district will be selected. Five urban and rural areas will be selected from each block and then the respondents will be selected based on the proportion of the individuals of each category.

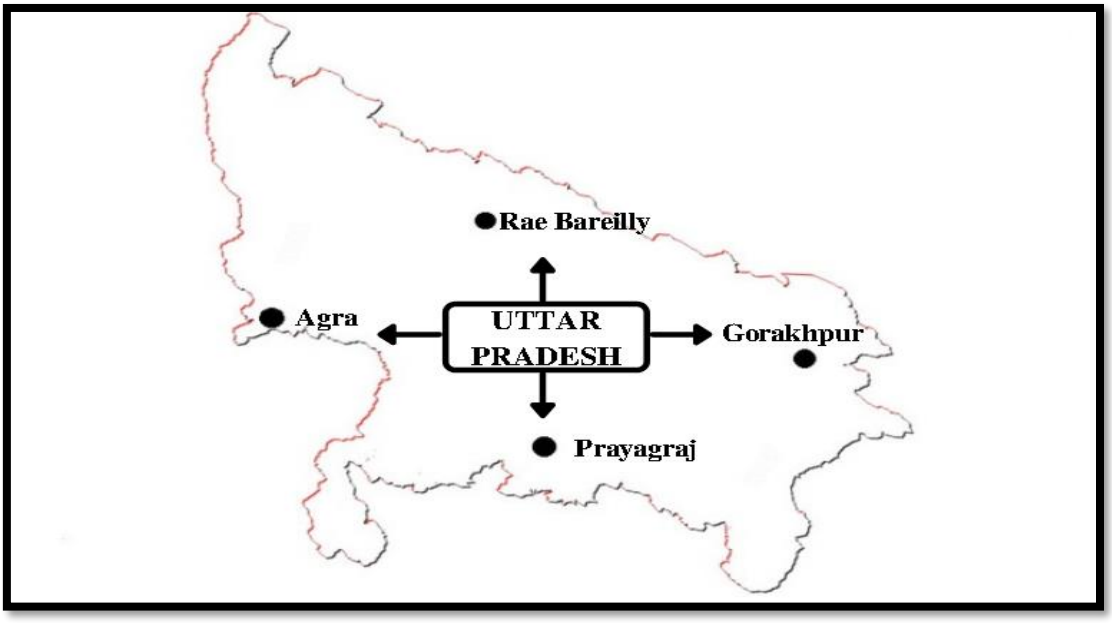

Figure 2: Districts Selected from Different Zones
Source: Hiox India

5.3.3 ***Sample Size:*** 500 individuals (*Annexure 3*)

The finite population correction will be used for sample size determination. A sample of 400 individuals is calculated to be the minimum size of the stratum. For accuracy, a sample of 100 more individuals will

be taken for the research. Thus, 500 individuals will be taken as the total sample size for the study.

5.3.4 ***Sampling Framework:*** The sampling framework will be as follows-

Table 1: Sampling framework

S. No.	U T T A R P R A D E S H	Zones	District	Total population (Census 2011)	Sample size	Sampling Distribution	
						Urban	Rural
1.		NORTH	Rae Bareilly	4,448,359	115	41 (35.26)	74 (64.74)
2.		SOUTH	Prayagraj	5,954,391	155	38 (24.74)	117 (75.26)
3.		EAST	Gorakhpur	4,440,895	115	22 (18.83)	93 (81.17)
4.		WEST	Agra	4,418,797	115	53 (45.81)	62 (54.19)
Total				19,262,442	500		

Figures in parentheses indicate percentages

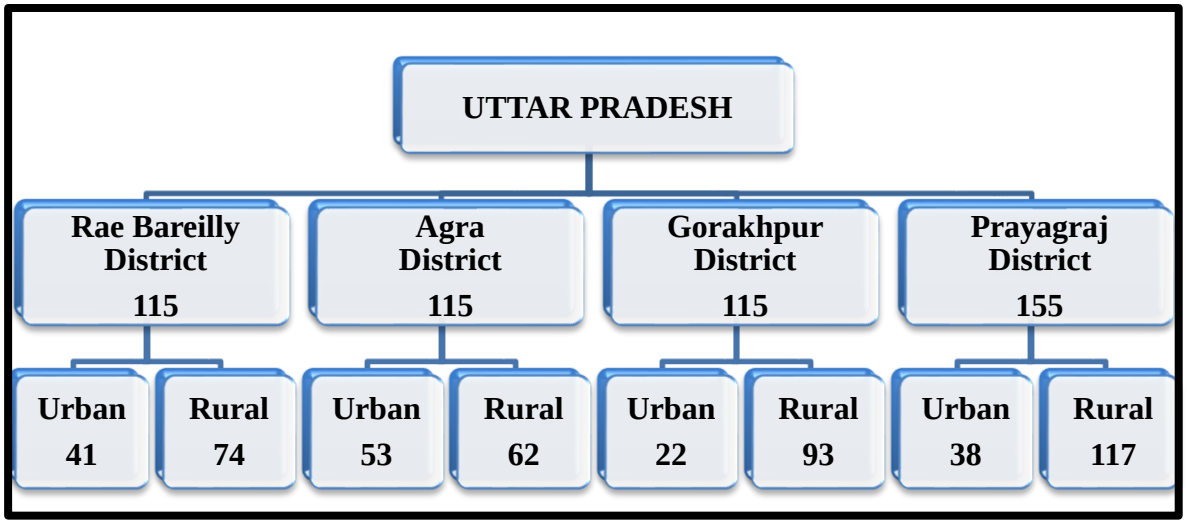

Figure 3: Sampling Framework
Self-Structured

5.4 Hypotheses: The study will test the following hypotheses:

$H_0$1: The digital divide does not exist.

$H_1$1: The digital divide does exist.

$H_0$2: There is no significant impact of the digital divide on individuals.

$H_1$2: There is a significant impact of the digital divide on individuals.

5.5 Research Method and Tools for Data Collection: The study will use the Survey Method. The primary data will be collected through self-structured schedules and questionnaires.

5.6 Statistical Tools and Techniques: For carrying out an analysis of the collected data, both descriptive and inferential statistics will be used for obtaining reliable results. Besides it, both qualitative and quantitative statistical tools and techniques will be used. Binary scales, logistic regression, Causal Loop Diagram (CLD), parametric tests (such as z-test and ANOVA), non-parametric tests (such as chi-square test and Kruskal-Wallis H test), and descriptive statistics will be used. Summarized research methodology is presented in table 2.

Table 2: Summary of Research Plan

S. No.	Research Objectives	Research Plan
1.	To analyze the status and extent of the digital divide.	For achieving the first objective, the status of the digital divide will be analyzed for all three levels. Descriptive statistics, binary logistic regression, internet penetration rate, skill gap analysis, Digital Opportunity Index (DOI), and Digital Divide Index (DDI) will be used.
2.	To assess the impact of the digital divide on individuals.	To fulfill the second objective, the impact of the digital divide on individuals will be measured. The analysis will include the impact of the digital divide on an individual's education, health, work status, economic, social, and daily activities. The impact will also be assessed with respect to COVID-19. Descriptive statistics, CLD, and the Likert scale will be used.
3.	To explore the factors responsible for the digital inequality	For finding out the factors responsible for the divide and the effect of each factor for digital exclusion, multiple regression analysis, factor analysis, correlation, and CLD will be used.
4.	To analyze challenges in bridging the digital gap and to propose a strategic framework to address the problem.	Various barriers and challenges will be identified based on the above-mentioned objectives and probable measures will be suggested for bridging the gap and bringing digital inclusion.

	Hypotheses	Research Methodology
$H_0 1$:	The digital divide does not exist	Parametric tests (z-test and ANOVA) will be used. The hypothesis will be tested for all three levels.
$H_1 1$:	The digital divide does exist	
$H_0 2$:	There is no significant impact of the digital divide on individuals	The chi-square test and Kruskal-Wallis H test will be used.
$H_1 2$:	There is a significant impact of the digital divide on individuals	

5.7 Computer Applications: MS Excel, SPSS, Vensim

PROPOSED CHAPTERS

Chapter 1: Introduction

Chapter 2: Review of Literature

Chapter 3: Research Methodology

Chapter 4: Digital Divide: An Overview

Chapter 5: Determinants and Impact of the Digital Divide

Chapter 6: Bridging the Digital Gap: Challenges and Strategic Framework

Chapter 7: Conclusions

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ANNEXURE 1

SUMMARY SHEET OF REVIEW OF LITERATURE

I: *First Level Digital Divide* ***II:*** *Second Level Digital Divide* ***III:*** *Third Level Digital Divide*

S. No.	Author	Year	Source	Objective	Inequalities				Determinants	Impact	Challenges
					Others	Digital Inequality (Levels)					
						I	II	III			
1.	Agrawal, B.	2020	Asian Journal of Law and Economics	Proposed a framework to reform the taxation policies for fighting income inequality in India.	Income and tax						
2.	Aissaoui, N.	2021	Global Knowledge, Memory, and Communication	Highlighted the shortcomings of the three levels of the digital divide in light of the COVID-19 pandemic.		✓	✓	✓			✓
3.	Alam, et al.	2015	BKPAI Working Paper Series	Examined issues of health and well-being in low-income or developing countries.	Health and well-being						
4.	Amutha, D.	2017	SSRN Papers	Identified the determinants of gender inequality and also suggested measures to eradicate the problem.	Gender				Economic, social, cultural, political and legal factors.		
5.	Anand, et al.	2021	The Indian Journal of Labour Economics	Focused on the several dimensions of inequality in the labour market associated with the presence of basic	Gender and Income						

				necessities.							
6.	Aqili, et al.	2008	The Electronic Library	Analyzed the concept of the digital divide and also focused on different dimensions of the digital divide primarily associated with the libraries.		✓				Service sector (education) and libraries	
7.	Asfiya, et al.	2021	Journal of Exclusion Studies	Highlighted the digital inclusion norms through CSCs grass-root level in rural areas. It also analyzed the challenges faced by people in the rural areas.		✓					✓
8.	Ayanso, et al.	2010	Information Technology for Development	Measured the digital divide among different countries. It also analyzed the regional digital divide.		✓					
9.	Bach, et al.	2013	Procedia Technology	Presented a review of several papers on the digital divide in firms and analyzed the extent of the digital inequality.		✓	✓		Internal and external factors such as size, geographical area, region, industry, training, and education of employees.	Firms	
10.	Bajpai, et al.	2020	CSD Working Paper Series	Explored the short-term medical and institutional impact of COVID-19. Studied the long-term resiliency of the individuals and groups to the pandemic. It also		✓				Healthcare and Institutions	✓

				included the challenges of ICT initiatives.							
11.	Balasubramanian, et al.	2021	IMF Working Paper	Worked on the extent of locational differences concerning inequality in India. It also focused on the disparity in the living standards of the Indian population.	Living standards						
12.	Bannerjee, A.	2013	International Journal of Development Research	Evaluated the status of women in different Indian states concerning several gender-related indicators.	Gender						
13.	Block, et al.	2020	Nature Human Behaviour	Adopted a social network-based approach to evaluate the effectiveness of the strategies designed for the post-covid period.		✓					
14.	Bogdat-Brzezinska, A.	2020	Journal of Geography, Politics, and Society	Explored the current level of global information society. It also included the association between digital divide and globalization.		✓					
15.	Bourguignon, F.	2018	International Monetary Fund: Finance and Development	Explored the level of economic inequality in the world. Compared the status of inequality in developed and developing countries as well.	Economic, income and wealth						
16.	Buys, et al.	2008	Policy Research Working Paper: World Bank Group	Analyzed the status of cell phone coverage associated with the several determinants of the digital divide in Sub-Saharan		✓			Installation and maintenance cost factors such as elevation, slope, and		

				Africa.					distance.		
17.	Chinn, et al.	2004	NBER Working Paper	Identified the disparities in countries regarding personal computers and the internet. Studied the determinants affecting the countries in terms of digital usage.		✓	✓		Economic & demographic variables, infrastructure indicators and regulator pricing.		
18.	Cilan, et al.	2007	Government Information Quarterly	Analyzed the presence of digital divide among the members of the European Union, new as well as candidate countries. Included the relationship between the digital divide and the process of a new member country.		✓					
19.	Cinango, F.	2014	OECD Social, Employment and Migration Working Papers	Explored whether developments regarding income inequality might have an impact on the economic performance and educational aspects of the economy.	Income						
20.	Data Reportal	2021	Data Reportal	Formulated statistics regarding the total global internet and mobile phone users and carriers. Analyzed the users of social media.		✓	✓				
21.	De, et al.	2020	International Journal of Information Management	Examined the surge in the digital aspects during and after the pandemic. Identified prominent issues in the different		✓	✓				✓

				segments of the economy.							
22.	Dijk, Jan A.G.M. van	2006	Poetics	Focused primarily on the concept of the digital divide. Involved the access and skills component and addressed the inequality in the information society.		✓	✓				
23.	Dutton, et al.	2013	Oxford Internet Survey Report (OxIS)	Evaluated the cultures of using the internet in Britain. Identified and analyzed different concepts of the digital divide such as adoption and usage of ICT.		✓	✓				
24.	Eshetu, et al.	2010	University of Boras	Identified the status of access, use, and the level of internet penetration in Eastern Africa.		✓	✓				
25.	Ferreira, et al.	2021	Geoforum	Investigated and provided detailed analysis on the urban digital divide including the concept of VGI platforms.		✓	✓	✓		Restaurants and similar establishments	✓
26.	Ferro, et al.	2007	International Conference on Electronic Government	Derived empirical evidence associated with the process of IT skills and also involved the three IT skill acquisition approaches.		✓	✓				
27.	Gupta, N.	2017	Equality, Diversity, and Inclusion	Analyzed the extent of gender inequalities in organizations with educated professionals.	Gender						
28.	Gwatkin, D.R.	2000	Bulletin of the	Presented the initial	Health						

			World Health Organization	findings of the renewed concern of health inequalities. Stimulated the movement for action to correct the problems.							
29.	Hanna, Katie Terrell	2021	WhatIs-Tech Target	Summarised the concept, current trends, origins, and even the ways to bridge the digital divide at all levels.		✓					
30.	Helsper, Ellen Johanna	2008	Department for Communities and Local Government	Highlighted the issues of digital inclusion and prepared models for both inclusion and social exclusion.		✓					
31.	Islam, et al.	2021	SAGE Open	Identified the factors responsible for digital inequality.		✓			Educational, infrastructural, social, economic factors, and usable design		
32.	Jackman, et al.	2021	Nature Human Behaviour	Proposed to help students gain digital skills for their educational aspects. Suggested measures to facilitate digital citizenship and proper learning conditions.		✓	✓			Education	
33.	KADO	2004	ITU	Included the definition of the digital divide along with the issues. Involved the operations and measurements of the digital divide.		✓	✓	✓			✓
34.	Katz, Y.	2019	Advances in Applied	Investigated the social gap and a major difference		✓					

			Sociology	between the developed countries and start-up nations. Added the influence on the countries regarding technology or society.							
35.	Kilenthong, et al.	2014	Telecommunications Policy	Addressed the ICT adoption decisions of households in Thailand.		✓				Education, wealth, and occupation	
36.	Kumar, et al.	2021	Information Systems and e-Business Management	Highlighted the phenomenon of digital inclusion and also developed strategies and tactics that would be beneficial for promoting digital inclusion.		✓	✓				
37.	Kundu, P.	2014	Centre for Budget and Governance Accountability	Presented an overview and the inequalities in the education sector of India.	Education						
38.	Liu, Ji	2021	SAGE Open	Examined the student learning in pandemic situations. Analyzed the strategies for combating the digital divide in China. Identified the features of distance learning and educational options through digital techniques.		✓				Education	
39.	Lyons, et al.	2019	The Future of Work and Education for the Digital Age: T-20 Japan, 2019	Recommended to bridge the digital skills and jotted the impact on employment possibilities.		✓	✓			Employment	✓

40.	Nayyar, G.	2008	Economic and Political Weekly	Analyzed the situation of the Indian states at different levels of income and development to converge into similar steady-state paths.	Regional						
41.	Nkanu, et al.	2010	Library Philosophy and Practice (e-journal)	Evaluated the concept and importance of the digital divide and ICT. Studied the impact on libraries. Analyzed the several advantages of having and using the internet and related services.		✓	✓			Nigerian Libraries	
42.	OECD	2017	The OECD Centre for Opportunity and Equality	Proposed the status of income, health, gender, regions, well-being, education and innovation in developed and developing countries.	Income, health, gender, well-being, innovation and education						
43.	Pinkett, Randal D.	2003	Encyclopedia of Information Systems	Analyzed different determinants that might affect the digital divide.		✓			Income, education, race, geography, income, and race	Education	
44.	Prudhomme, et al.	2009	The Illinois Report, 2009	Studied the concept and meaning of the digital divide along with the specific research and policy goals applicable to Illinois.		✓					✓
45.	Ragnedda, et al.	2018	Journal of Russian Media and Journalism Studies	Focused on the different levels of the digital divide in East EU countries.		✓	✓	✓		Government services, health, and commerce	

46.	Ramos, M.	2020	World Economic Forum	Highlighted the reliance on digital infrastructure and connectivity along with ways to bridge the digital gap.		✓					✓
47.	Rodriguez-Abitia, et al.	2020	Multidisciplinary Digital Publishing Institute: Sustainability	Analyzed the adoption of digital techniques by different educational institutions of higher education. Proposed ways to apply them to the educational processes.		✓				Education	
48.	Ruiu, et al.	2017	Routledge Advances in Sociology	Explored the multidimensionality of social capital approaches associated with social and digital inequalities. Exhibited interrelationships of the digital divide and inequalities.		✓	✓	✓			
49.	Sahasranaman, et al.	2020	ResearchGate Publication	Studied the presence of income inequality in India along with the urban and rural inequality split.	Income						
50.	Sanders, R.	2020	ESSS Online	Highlighted the concepts of digital inclusion, digital exclusion, participation, social exclusion, digital capability and literacy.		✓					
51.	Seale, J.	2009	Economic and Social Research Council	Studied the concept of digital inclusion and its relationship with the access, use, and participation of		✓	✓			Educational institutions, families, homes and communities,	

				individuals towards digital techniques. Identified and analyzed the impact of digital inclusion on different sectors and services.						and social structures	
52.	Selwyn, N.	2004	New Media and Society	Presented a theoretical framework and evaluation of the digital divide limiting to the access and use component. Involved hierarchical relationship between different conceptual stages associated with the digital divide.		✓	✓				
53.	Sheikh, M. M.	2017	International Journal of Advanced Research and Development	Discussed several initiatives taken to promote digital awareness and information. Focused on the challenges or key points that work as a barrier in digital up-gradation.		✓					✓
54.	Shortt, et al.	2020	Public Policy Forum	Found several issues in the system of employment in Canada due to digital skills and careers. Suggested a gateway to the policymakers for bridging the digital skill gap in companies.		✓	✓			Business and government	✓
55.	Sivakumar, M.	2008	Munich Personal RePEc Archive	Explored the problem of gender discrimination in India, its different forms as	Gender						

				well as its causes.							
56.	Sorj, B.	2008	Scielo Books	Investigated the different dimensions of the digital divide. Analyzed the impact of digital techniques and services on several sectors.		✓			Infrastructure, connection equipment, training, and the production and use of specific contents.	Communication, education, science and technology, health, and government.	
57.	Spitzer, et al.	2013	Capgemini Consulting	Highlighted the impact of digital techniques on the working and operations of the IT department of the industries.		✓	✓			Business organizations	
58.	Telecom Regulatory Authority of India	2021	TRAI	Covered the telecom statistics in India along with different categories and parameters.		✓	✓				
59.	Tomer, et al.	2020	Brookings Metro	Described the major challenges of internet and technology penetration in America. Included suggestions for reducing the digital network gap.		✓	✓				✓
60.	Varallyai, et al.	2013	Procedia Technology	Promoted e-skills to reduce the digital gap.		✓	✓			Education providers, government, and industries	
61.	Venkatanarayana, M.	2011	Munich Personal RePEc Archive	Analyzed the trends in economic growth, its impact on the living conditions as well as association with the rural and agriculture sector.	Living standards						
62.	Venkatesan, Dr. S.	2019	Indian Journal of Applied	Analyzed the different issues of gender inequality	Gender						

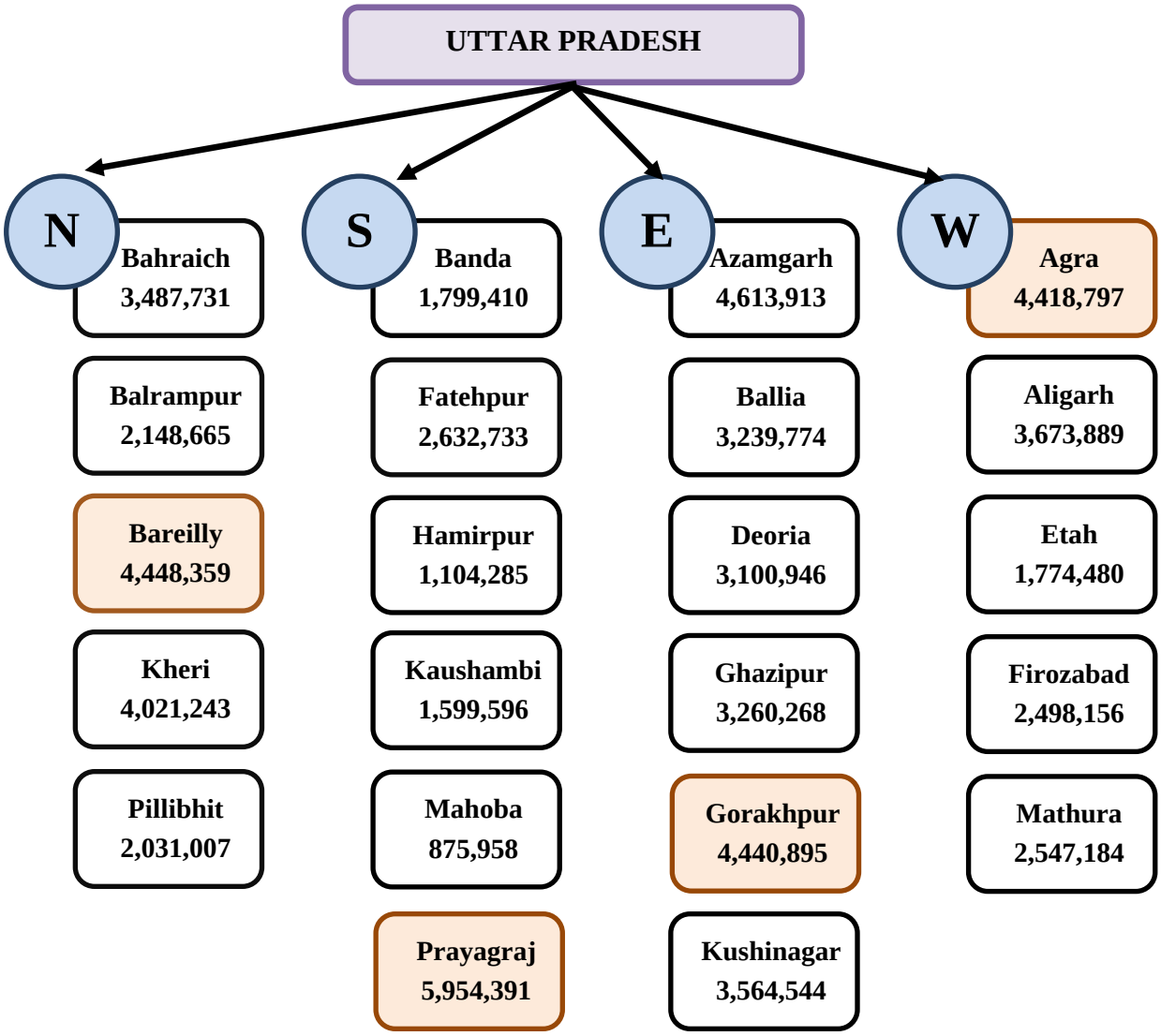
			Research	in India.							
63.	Voitchovsky, S.	2009	The Oxford Handbook of Economic Inequality	Investigated a complex and multi-dimensional inequality effect on the growth of the economy.	Income and wealth						
64.	West, et al.	2019	Equals	Outlined the persistence and severity of the gender digital gap. Provided a statement of interventions and recommended aspects for promoting gender equality regarding digital techniques.			✓			Education	✓
65.	World Inequality Report	2021	World Inequality Lab	Presented the most recent and accurate data on inequality for estimating the situation worldwide.	Overall						
66.	World Social Report	2020	United Nations Publications	Examined the impact and effect of four megatrends on inequality in the world.	Overall						
67.	Yanti, et al.	2014	Afro Asian Journal of Social Sciences	Explained the determinants of the digital divide in different cities.		✓	✓		Age, sex, level of education, monthly occupation, marital status, and the number of members in the family.		

ANNEXURE 2

Annexure 2A

DISTRICT-WISE COMPOSITION OF UTTAR PRADESH

N- North Zone *S- South Zone* *E- East Zone* *W- West Zone*

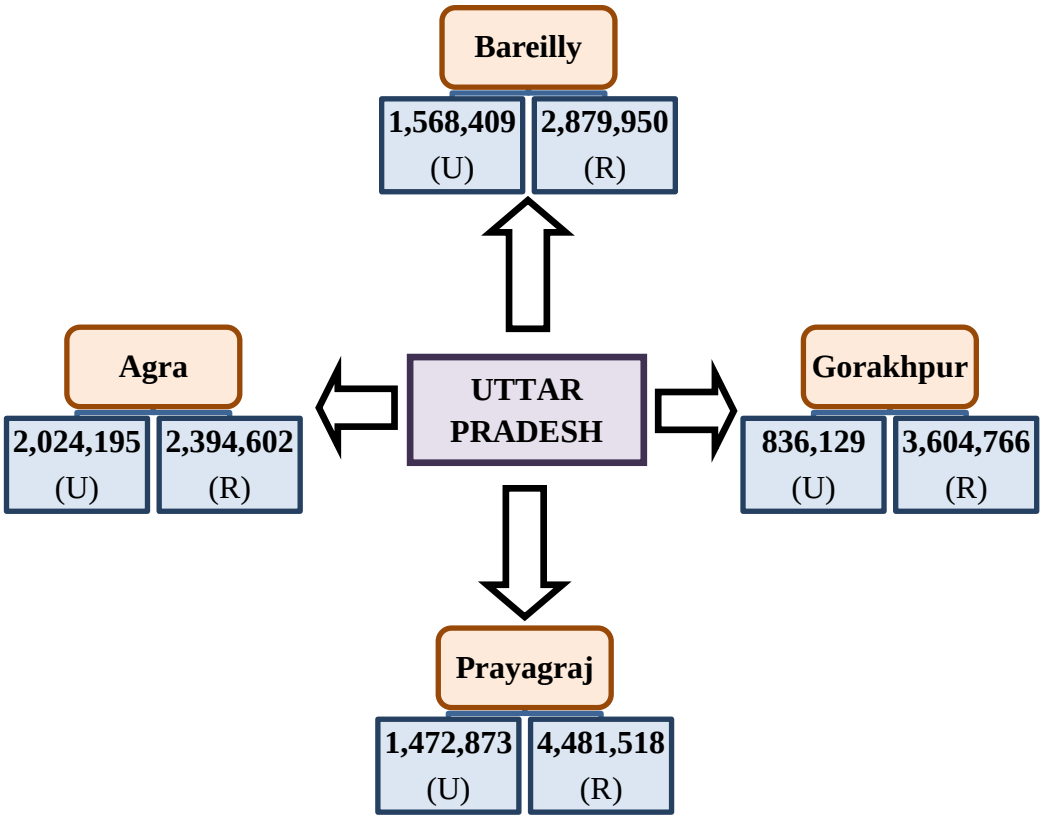


Data Source: Census 2011

Annexure 2B

URBAN AND RURAL AREA COMPOSITION OF THE SELECTED DISTRICTS

U: Urban *R: Rural*



Data Source: Census 2011

ANNEXURE 3

FINITE POPULATION CORRECTION

The formula for sample size determination is as follows-

$$n' = \frac{NZ^2P(1-P)}{d^2(N-1) + Z^2P(1-P)}$$

Denotations-

n': Sample size with finite population correction

N: Population size

Z: Z statistic for a level of confidence (1.96)

P: Expected proportion (0.5 - in the proportion of one)

d: Precision (0.05 - in the proportion of one)

The minimum sample size from the above formula is calculated to be **n' = 385 ≈ 400**